

D.4.12 Notation

Symbol	Description	Units	Typical Units	
			English	SI
A	Equilibrium beach profile coefficient	$L^{1/3}$	$ft^{1/3}$	$m^{1/3}$
B	Berm height	L	ft	m
C	Wave phase velocity or celerity	L/T	ft/s	m/s
C_G	Wave group velocity	L/T	ft/s	m/s
C_k	Sample kurtosis	--	--	--
C_p	Plant drag coefficient	--	--	--
C_s	Sample skewness	--	--	--
C_0	Deepwater wave celerity, $gT / 2\pi$	L/T	ft/s	m/s
D	Quarrystone diameter	L	ft	m
	Dune height	L	ft	m
D_{50}	Size of 50 th percentile of sediment	L	mm	mm
d_h	Depth over berm	L	ft	m
E	Wave energy	LF/L	ft-lb/ft	N-m/m
	Crest elevation of structure	L	ft	m
$E_{HotSpot}$	Extra profile lowering at a hot spot	L	ft	m
E_j	Beach-dune juncture elevation	L	ft	m
E_{jMLWP}	Beach-dune juncture elevation for the MLWP	L	ft	m
E_{jStorm}	Beach dune juncture elevation during a storm	L	ft	m
E_T	Total still water elevation	L	ft	m
e	Base of natural logarithms ($=2.718$)	--	--	--
F	Cumulative probability function	--	--	--
F_c	Freeboard	L	ft	m
F'	Dimensionless freeboard	--	--	--
F_H, F_T, F_{gamma}	Static setup coefficients in DIM model	--	--	--
F_{slope}				
F_n	Discrete spectral frequency	$1/T$	hz	hz
F_R	Wind wave runup coefficient	--	--	--
f	Wave frequency	$1/T$	hz	hz
	Darcy-Weisbach resistance coefficient	--	--	--
	Probability density function	--	--	--
f_e	Coriolis coefficient	$1/T$	$1/S$	$1/S$
f_p	Spectral peak frequency, $1/T_p$	$1/T$	hz	hz
G_H, G_T, G_{gamma}	Dynamic setup coefficients in DIM model	--	--	--
G_{slope}				
G_0	Normalizing function for directional spectrum spreading function	--	--	--

Symbol	Description	Units	Typical Units	
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$G(\theta)$	Directional spectrum spreading function	--	--	--
$G(f, \theta)$	Directional spreading function	--	--	--
g	Gravitational acceleration	L/T ²	ft/s ²	m/s ²
H	Wave height	L	ft	m
H'_o	Unrefracted deep water wave height	L	ft	m
H_b	Breaking wave height	L	ft	m
H_{m0}	Spectral significant wave height	L	ft	m
H_o	Deep water wave height	L	ft	m
H_s	Significant wave height	L	Ft	m
H_x	Wave height at x location in surf zone	L	ft	m
h_*	Wave structure parameter	--	--	--
h	Water depth	L	ft	m
h_b	Breaker depth	L	ft	m
h_c	Depth over crest	L	ft	m
h_m	Height of the land barrier	L	ft	m
h_o	Depth over crest	L	ft	m
K_s	Shoaling coefficient	--	--	--
$K_s(f_n)$	Spectral shoaling coefficient	--	--	--
$K_r(f_n, \theta_{o,n,m})$	Spectral refraction coefficient	--	--	--
k	Wave number, $2\pi / L$	rad/T	rad/ft	rad/m
	Bluff erosion parameter	--	--	--
L	Likelihood	--	--	--
LL	Log-likelihood	--	--	--
L_{berm}	Berm width	L	ft	m
L_{om}	Spectral deep water wave length	L	ft	m
L_0	Deep water wave length, $gT^2 / 2\pi$	L	ft	m
$M(n)$	Number of direction components in spectrum at f_n	--	--	--
m	Beach slope (rise/run)	L/L	--	--
m_n	n^{th} moment of spectral density, $\int_{f_1}^{f_2} f^n S(f) df$	L^2/T^n	ft^2/s^n	m^2/s^n
N	Degrees of freedom of a chi-squared distribution	--	--	--
	Number of waves	--	--	--

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P	Average porosity of rubble structure cover layer	--	--	--
	Precipitation rate	L/T	in./hr	mm/hr
	Probability	--	--	--
Q	Dimensionless overtopping	--	--	--
q	Mean overtopping rate per unit length	L^2/T	ft^2/s	m^2/s
R	Total wave runup	L	ft	m
	Spearman statistic	--	--	--
R_{iuc}	Incident wind wave runup	L	ft	m
R_m	Reduced recession due to storm duration	L	ft	m
R_{Total}	Total runup (static setup plus dynamic setup plus incident wave runup.)	--	--	--
$R_{2\%}$	Runup exceeded by 2% of the runup crest	L	ft	m
R_∞	Maximum potential profile recession	L	ft	m
$R_{\infty HotSpot}$	Potential recession at a hot spot	L	ft	m
$R_{\infty storm}$	Potential recession for storm	L	ft	m
r	Linear correlation coefficient			
S	Water level change	L	ft	m
S_c	Compressive strength of bluff material	F/L^2	lb/ft^2	N/m^2
$S(f)$	Spectral density	$L^2 \cdot T^2$	ft^2/hz	m^2/hz
$S(f, \theta)$	Directional spectral density	$L^2 T / deg$	$(ft^2/hz)/deg$	$(m^2/hz)/deg$
$S_0 (f_n, \theta_{o,n,m})$	Discrete directional spectrum in deep water	$L^2 \cdot T^2$	ft^2/hz	m^2/hz
$S_{ns} (f_n, \theta_{o,n,m})$	Discrete directional spectrum in nearshore	$L^2 \cdot T^2$	ft^2/hz	m^2/hz
s	Sample standard deviation	--	--	--
$S(f)$	Continuous spectrum	$L^2 T$	ft^2/hz	m^2/hz
T	Wave period	T	s	s
T_D	Storm duration	T	hr	hr
T_p	Spectral peak period, $1/f_p$	T	s	s
T_s	Significant wave period	T	S	S
	Time scale for beach profile response	--	--	--
t	Time	T	s	s
V_c	Velocity at crest	L/T	ft/s	m/s
V_f	Fall velocity	L/T	ft/s	m/s

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V_{max}	Maximum overtopping volume per wave per unit length	L^2/wave	ft^2/wave	m^2/wave
v	Horizontal (y) component of local fluid velocity (water particle velocity)	L/T	ft/s	m/s
W	Wind speed	L/T	ft/s	m/s
W_b	Surf zone width to breaker line	L	ft	m
W_c	Wind stress coefficient term	L/T	mph	kph
W_x	x component of wind speed	L/T	mi/hr	m/s
W_y	y component of wind speed	L/T	mi/hr	m/s
X	Accumulated bluff to erosion	L	ft	m
\bar{x}	Sample mean	--	--	--
x,y,z	Right-handed Cartesian coordinates	L	ft	m
$y_{G,inner}$	Seaward extent of overtopping	L	ft	m
$y_{G,outter}$	Landward extent of overtopping	L	ft	m
y_0	Cross-shore location of structure crest	L	ft	m
z_c	Structure crest elevation	L	ft	m
z_G	Elevation behind crest	L	ft	m
$()_b$	Term evaluated at the breaker line	--	--	--
$()_o$	Term evaluated in deep water	--	--	--
$\tan \alpha$	Structure slope	--	--	--
α	Storm duration recession reduction factor	--	--	--
	JONSWAP Spectrum term	$L^2 T$	ft^2/hz	m^2/hz
α_c	Structure crest slope	--	--	--
β	Storm profile response coefficient	--	--	--
	Wave angle at structure	deg	deg	deg
γ	Specific gravity of a fluid	F/L^3	lb/ft^3	N/m^3
	Peak enhancement factor used in the JONSWAP spectrum	--	--	--
γ_b	Breaker depth index	--	--	--
	Runup berm coefficient	--	--	--
$\gamma_r \gamma_p \gamma_b \gamma_f, \gamma_\beta$	Runup reduction coefficients	--	--	--
Δf	Frequency increment	$1/T$	hz	hz
ΔR	Potential excess runup	L	ft	m
ε	Energy dissipation rate	F/LT	$\text{lb}/\text{s}\cdot\text{ft}$	$\text{n}/\text{m}\cdot\text{s}$
$\hat{\eta}$	Dynamic or oscillating setup	L	ft	m
$\bar{\eta}$	Mean or static wave setup	L	ft	m
$\bar{\eta}_b$	Static setdown at the breaker point	L	ft	m

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$\bar{\eta}_{max}$	Maximum static wave setup	L	ft	m
$\bar{\eta}_{min}$	Minimum static wave setup	L	ft	m
$\bar{\eta}_o$	Static setup at the shoreline	L	ft	m
$\eta(x,t)$	Displacement of water surface relative to SWL	L	ft	m
$\overline{\eta^2}$	Mean square of water surface fluctuations	L^2	ft^2	m^2
η_3	Coefficient of skewness	--	--	--
η_4	Coefficient of kurtosis	--	--	--
η_i	Water surface displacement by incident wave	L	ft	m
η_{rms}	rms value of free surface elevation	L	ft	m
$\bar{\theta}$	Overall mean wave direction	deg	deg	deg
θ	Direction of wave propagation	deg	deg	deg
θ_{main}	Main wave direction in a directional spectrum	deg	deg	deg
θ_m	Discrete wave direction	deg	deg	deg
$\theta_m(f)$	Mean wave direction as a function of frequency.	deg	deg	deg
κ	Breaker index	--	--	--
μ	Wind stress factor	--	--	--
μ	Population Mean	--	--	--
v	Spectral narrowness parameter	--	--	--
ξ	Surf similarity parameter or Iribarren number	--	--	--
ξ_{om}	Spectral deep water ξ	--	--	--
ξ_0	Deep water ξ	--	--	--
π	Constant = 3.14159	--	--	--
ρ	Mass density of water	M/L^3	slug/ ft^3	kg/m^3
ρ_a	Mass density of air	M/L^3	slug/ ft^3	kg/m^3
ρ_{fw}	Mass density of fresh water	M/L^3	slug/ ft^3	kg/m^3
ρ_s	Mass density of sediment	M/L^3	slug/ ft^3	kg/m^3
Ω	Rotational speed of the earth	rad/T	rad/S	rad/S
φ	Latitude	deg	deg	deg
τ_x, τ_y	Wind stress	F/L^2	lb/ ft^2	N/m^2
σ	Population standard deviation	L	ft	m